

# The Monthly Evening Sky Map

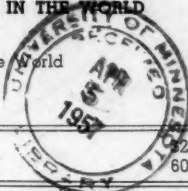
A SCIENTIFIC JOURNAL AND EDUCATIONAL GUIDE IN ASTRONOMY FOR THE AMATEUR

Founded in 1905 by Leon Barritt

ALSO A STAR, CONSTELLATION AND PLANET FINDER MAP ARRANGED FOR THE CURRENT  
MONTHS - MORNING AND EVENING - AND PRACTICAL ANYWHERE IN THE WORLD  
PUBLISHED QUARTERLY

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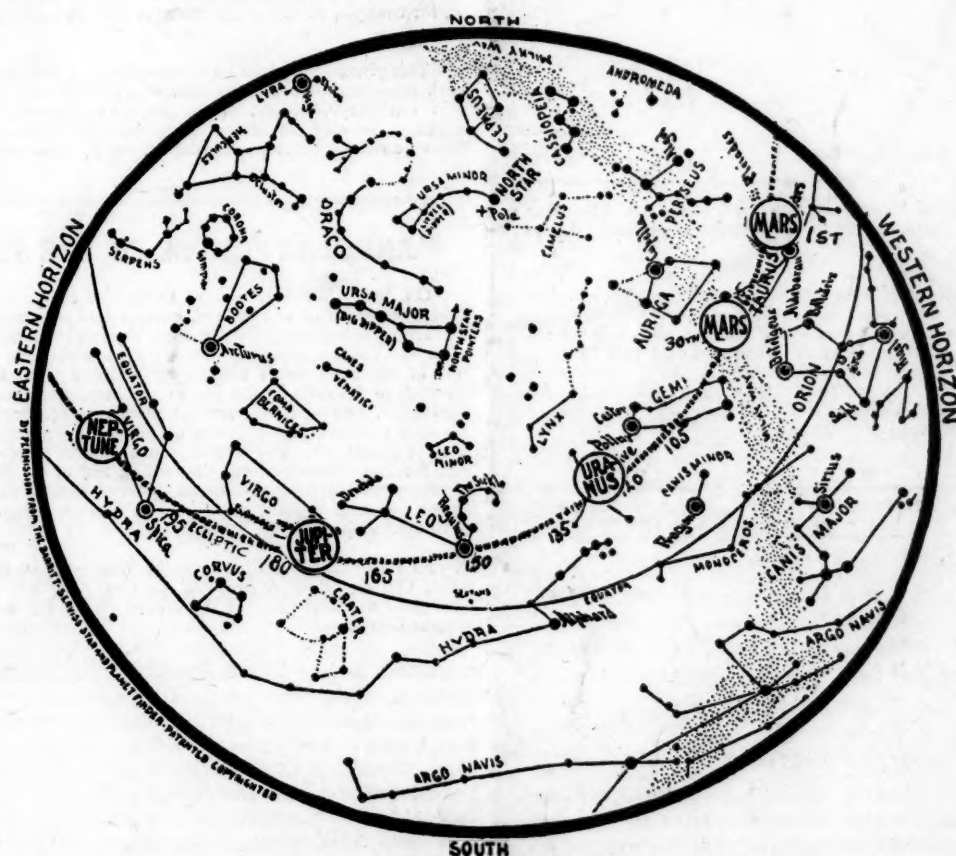


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## EVENING SKY MAP FOR APRIL



AT 9:00 P.M., APRIL 1

8:00 P.M., APRIL 15

7:00 P.M., APRIL 30

Face South and hold the Map overhead, the top North, and you will see the stars and planets just as they appear in the heavens. The arrow through the two stars in the bowl of the Big Dipper points to the North Star, the star at the end of the handle of the Little Dipper.

This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitude in Europe.

## TRANSIT OF MERCURY, MAY 5

On May 5th there will be a transit of Mercury across the disc of the Sun. Some phases, at least, of this transit will be visible over most of North America (except the extreme eastern edge), the Pacific, Indian, and Arctic Ocean areas, Asia, Australia, etc. As our drawing shows, this transit just does occur. Actually, at time of geocentric conjunction in right ascension, Mercury is still north of the Sun's disc; but the combination of its rapid southerly motion, plus the Sun's fairly rapid northerly motion, brings the planet onto the Sun's disc.

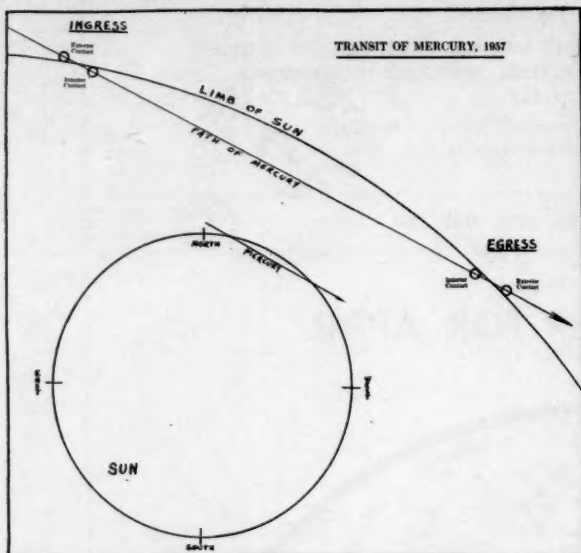


Diagram of path of Mercury across the face of the Sun. The upper portion of the diagram shows the relative size of Mercury's disc to that of the Sun.

Transits of Mercury are pretty rare, though more frequent than those of Venus. They occur only in May and November, with the most recent having occurred in 1953. The next is scheduled for November 7th, 1960, and after that none until May 8th, 1970.

The following table gives the times of the various contacts for selected locations; nearby stations will vary only a matter of seconds. All times are Eastern Standard Time:

LOCATION	INGRESS		EGRESS	
	EXTERIOR CONTACT	INTERIOR CONTACT	INTERIOR CONTACT	EXTERIOR CONTACT
Montgomery, Ala.	6:57.0 pm	7:06.7 pm		
Juneau, Alaska	6:55.6 pm	7:05.2 pm	9:20.8 pm	9:30.3 pm
Tucson, Ariz.	6:57.5 pm	7:07.3 pm		
Little Rock, Ark.	6:56.9 pm	7:06.7 pm		
Sacramento, Calif.	6:57.1 pm	7:06.9 pm	9:18.8 pm	9:28.6 pm
Denver, Colo.	6:56.7 pm	7:06.5 pm		
Dover, Del.	6:56.2 pm			
Tallahassee, Fla.	6:57.1 pm	7:06.9 pm		
Decatur, Ga.	6:56.8 pm	7:06.5 pm		
Honolulu, Hawaii	6:58.9 pm	7:08.8 pm	9:16.9 pm	9:27.0 pm
Boise, Idaho	6:56.6 pm	7:06.3 pm	9:19.5 pm	9:29.2 pm
Springfield, Ill. (also: Indiana, Iowa)	6:56.4 pm	7:06.1 pm		
Topeka, Kansas	6:56.6 pm	7:06.3 pm		
Louisville, Ky.	6:56.5 pm	7:06.2 pm		
New Orleans, La.	6:57.2 pm	7:07.1 pm		
Baltimore, Md.	6:56.2 pm			
Minneapolis, M.	6:56.1 pm	7:05.8 pm		
Hanover, N. H.	6:55.8 pm			

Princeton, N. J.	6:56.1 pm		
Santa Fe, N. M.	6:57.1 pm	7:06.9 pm	
Albany, N. Y.	6:55.9 pm		
Buffalo, N. Y.	6:56.0 pm	7:05.6 pm	
Raleigh, N. C.	6:56.5 pm		
Bismarck, N. D.	6:56.1 pm	7:05.8 pm	
Cleveland, Ohio	6:56.1 pm	7:05.8 pm	
Oklahoma City, O.	6:57.0 pm	7:06.7 pm	
Portland, Ore.	6:56.5 pm	7:06.2 pm	9:19.5 pm 9:29.3 pm
Pittsburgh, Pa.	6:56.2 pm	7:05.8 pm	
Columbia, S. C.	6:56.7 pm	7:06.4 pm	
Pierre, S. D.	6:56.3 pm	7:06.0 pm	
Nashville, Tenn.	6:56.7 pm	7:06.4 pm	
Austin, Texas	6:57.4 pm	7:07.2 pm	
Salt Lake City, U.	6:56.8 pm	7:06.5 pm	9:19.3 pm
Montpelier, Vt.	6:55.7 pm		
Charlottesville, Va.	6:56.3 pm	7:06.0 pm	
Seattle, Wash.	6:56.3 pm	7:06.0 pm	9:19.8 pm 9:29.5 pm
Charleston, W. Va.	6:56.4 pm	7:06.1 pm	
Madison, Wisc.	6:56.2 pm	7:05.8 pm	
Cheyenne, Wyo.	6:56.6 pm	7:06.3 pm	

NOTES: Missing times, above, indicate that the Sun has set and that the remainder of the transit is not observable from the particular location.

Times are given to tenths of a minute. Each tenth is 6 seconds, so, for example, 6:56.3 would mean 18 seconds after exactly 6:56 P. M.

This phenomenon is not a naked-eye one. A telescope must be used. However, a word of caution: direct observation of the Sun with a telescope, without proper protective measures, can cause blindness. Be sure that proper safeguards are employed — tinted filters (on small telescopes), solar diagonals, unsilvered mirrors, etc.

## ANNULAR ECLIPSE OF THE SUN

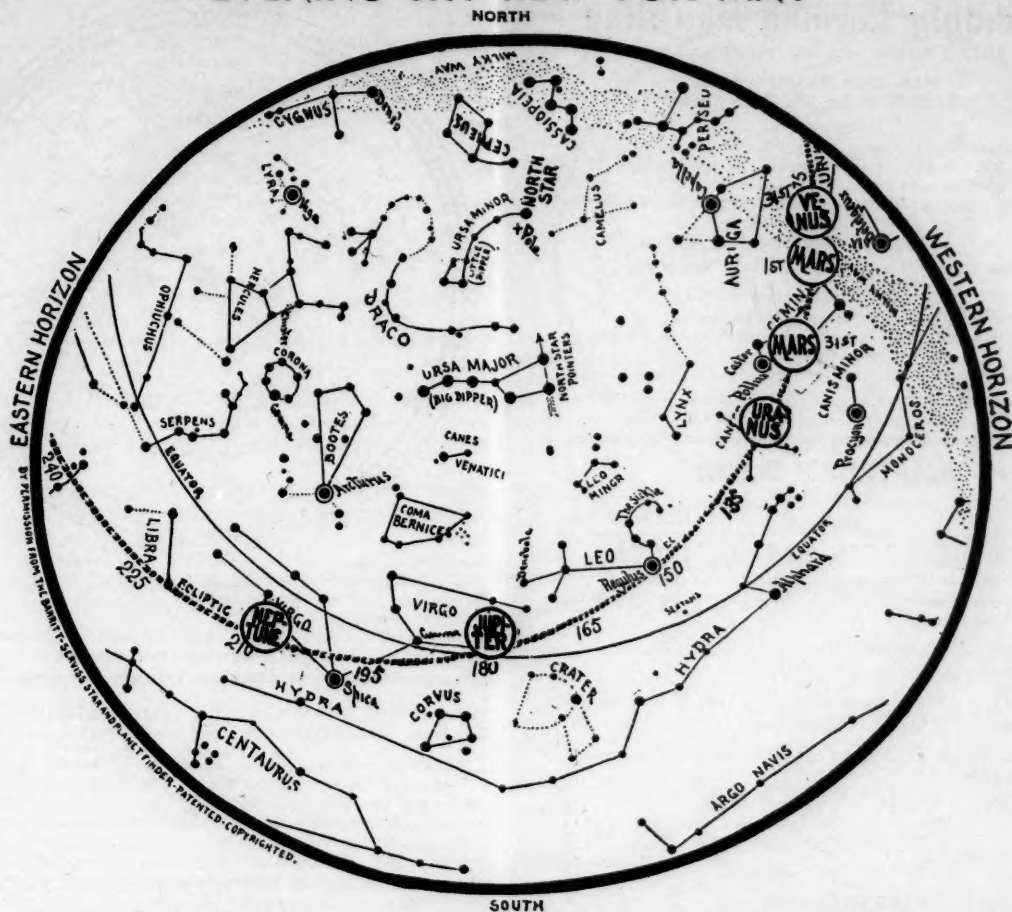
On April 29th there will be an annular eclipse of the Sun. This will be one of two unusual eclipses this year, the second a total eclipse occurring on October 23rd. Unusual about both eclipses is the fact that the axis of the Moon's shadow does not touch any part of the earth; with the eclipse of April 29th, the closest approach to the earth to the axis of the Moon's shadow is about eight miles. This limits the annular phase to a very small area of the earth's surface mostly in the ocean off the extreme northern coast of Russia. The only way a perfect annular eclipse (that is, with the Moon's disc perfectly centered on that of the Sun) could be seen would be from an airplane flying at an altitude of about 40,000 feet over a point 40° 4' east of Greenwich and 70° 40' north of the equator.

As a partial, this eclipse is visible over parts of the United States, Canada, all of Alaska, and most of Asia. The following table gives the local times of the various phases for some North American stations:

LOCATION	BEGINS	MIDDLE	MAGNITUDE	ENDS
Anchorage, Alaska	7:01 pm	8:03 pm	.39	9:02 pm
Fairbanks, Alaska	6:56 pm	8:00 pm	.47	9:01 pm
Juneau, Alaska	7:23 pm	8:19 pm	.34	9:11 pm
Nome, Alaska	6:38 pm	7:45 pm	.47	8:50 pm
Denver, Colo.	8:31 pm	8:50 pm	.05	..... pm
Boise, Idaho	8:22 pm	8:47 pm	.08	9:11 pm
Minneapolis, Minn.	8:02 pm	..... pm	.14	..... pm
Helena, Mont.	8:07 pm	8:43 pm	.17	9:17 pm
Bismarck, N. D.	8:02 pm	8:41 pm	.24	..... pm
Portland, Ore.	8:15 pm	8:43 pm	.09	9:10 pm
Pierre, S. D.	8:09 pm	..... pm	.19	..... pm
Salt Lake City, Utah	8:34 pm	8:50 pm	.03	9:06 pm
Seattle, Wash.	8:05 pm	8:40 pm	.14	9:14 pm
Cheyenne, Wyo.	8:24 pm	8:49 pm	.09	..... pm

All times are expressed in Eastern Standard Time. When no time is given, it means the Sun has set prior to the particular phase.

# EVENING SKY MAP FOR MAY



AT 9:30 P.M., MAY 1

8:30 P.M., MAY 15

7:30 P.M., MAY 31

Face South and hold the Map overhead, the top North, and you will see the stars and planets just as they appear in the heavens. The arrow through the two stars in the bowl of the Big Dipper points to the North Star, the star at the end of the handle of the Little Dipper. This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitudes in Europe.

## WHAT THE TELESCOPE DOES

If you have never looked through a telescope before, you will either be delighted or disappointed, depending on whether you expect too much or too little. Some visitors expect the telescope to show them stars as large as footballs, or to enable them to view at once, vast expanses of the sky. Others imagine that only the most powerful telescopes will show them features of any significance and are delighted to find that the main characteristics of celestial objects are fully revealed. To fully understand what the telescope will, or will not do, as well as comprehending exactly what one is looking at, requires considerable practice. Our visitors have time for only a quick glimpse, and so the brightest and most obvious objects are selected, and the demonstrators do their best to explain them.

It is a matter of some surprise to many, to discover that stars do not appear larger in the telescope. They are just points of light even in the largest instruments in the world. This is because of their vast distance from us, which renders their form completely invisible, although we know many of them to be tremendously larger than our Sun. Alpha Centauri is the nearest bright star to us, but the light takes 4 - 1/3 years to reach us even though it travels at a

speed of 186,000 miles per second. Some of the objects which will be seen through the telescope are so far away that thousands of years are required for the light to complete the journey. All these stars are suns similar to our Sun.

If the telescope does not magnify a star, why then bother with a telescope? The lens of the 9-inch telescope collect 730 times more light than the unaided eye, and this means that we can see stars which would otherwise be forever unknown without optical aid. Moreover, some stars which appear single to the eye are seen to be double stars with the telescope, while faint hazy star-like objects are broken up into a cluster of myriads of stars. From prolonged studies of such objects, astronomers have been enabled to discover much of the system of the universe in which we live.

However, revolving about the Sun are a number of planets, of which the Earth is one; and around the Earth revolves the Moon. Compared to the distances of the stars, the planets are very close to us, and these we can magnify a little. Thus we can see dark belts on Jupiter, the wonderful ring system of Saturn, markings on Mars and mountains on the Moon.

(continued on page 5)

# The Monthly Evening Sky Map

FOUNDED IN 1905 BY LEON BARRITT

MRS. LEON BARRITT, Editor  
Irving L. Meyer, Managing Editor

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Add five hours to convert to Greenwich Civil Time.

## AMATEUR'S FORUM

BY IRVING L. MEYER, M. S.

APRIL, 1957

**THE SUN:** is now north of the equator, moving from Pisces into Aries. The earth is moving toward *aphelion*, with distance from the Sun increasing from 92.8 million miles the 1st, to 93.6 million miles the 30th.

There will be an annular eclipse of the Sun on the 29th. Complete details are given elsewhere in this issue.

**THE MOON:** is closest to the earth the 11th, at 226,000 miles; it is farthest the 23rd, at 251,000 miles.

Libration: Maximum exposure of the region on the Moon's limbs takes place as follows:

April 5 East limb, 6.1°  
April 10 North limb, 6.7°  
April 18 West limb, 5.9°  
April 23 South limb, 6.8°

The Moon's Phases (E.S.T.):

First Quarter	April 7 at 3:32 pm
Full Moon	14 at 7:09 am
Last Quarter	21 at 6:00 pm
New Moon	29 at 6:54 pm

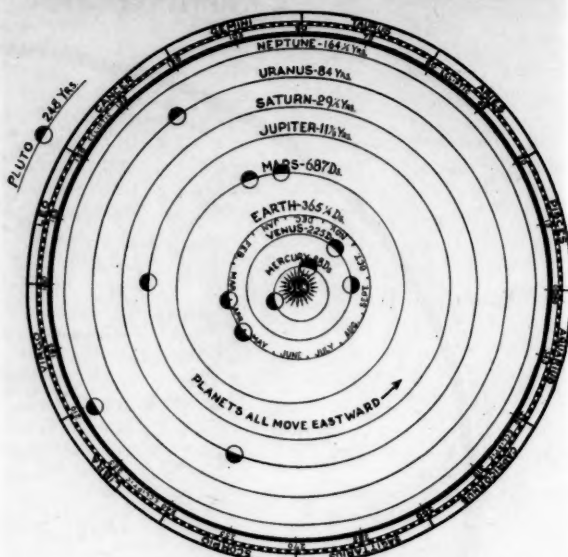
**MERCURY:** moves from Pisces into Aries during the month. It is in the evening sky the entire month, reaching its best position for observation on the 15th, on which date it will be 19° 45' from the Sun. This is truly the "elusive planet" and can never be seen under ideal conditions. But a keen-eyed observer will have little trouble seeing it for a few days around the 15th, as a bright, zero-magnitude star, very low in the west as darkness descends. Only 40% of the planet's disc is illuminated on the 15th, so that a telescope (with moderate magnification) will show the planet as a crescent. Geocentric distance the 1st is 113 million miles; the 30th, is 56 million miles.

**VENUS:** moves from Pisces into Aries, and is in superior conjunction with the Sun on the 14th. After conjunction it enters the evening sky. It is too close to the Sun the entire month to be observable. Greatest distance from the earth is reached the 18th, at 161 million miles, at which time its apparent diameter shrinks to a minimum of just under 10".

**MARS:** remains in the evening sky, fleeing in advance of the pursuing Sun. In Taurus all month, it sets well before midnight. Distance from the earth continues to increase rapidly; this month, from 175 million miles the 1st, to 197 million miles the 30th. Accordingly, magnitude decreases from 1.6 to 1.8, and apparent diameter from 5.0" to 4.4". As a telescopic object, it is now much too far away to be of interest.

**JUPITER:** is king of the night sky. In Virgo, it is well-placed for observation from either hemisphere, and remains above the horizon most of the night. On the 15th, distance is 424 million miles, magnitude is -1.9, equatorial diameter is 43", and polar diameter 40". Jupiter is an ideal object for the telescope—its disc is large, the flattening at the poles is readily apparent, the cloud

## HELIOCENTRIC POSITIONS OF THE PLANETS, APRIL



The planets are shown in their respective orbits. Two positions, one for the first, and one for the last day of the month are given for Mercury, Venus, Earth, and Mars. The arrow indicates the last day of the month. Jupiter, Saturn, Uranus, Neptune, and Pluto are shown in their mean position for the current month.

bands are plain—all considered, it is an easy and interesting planet. The four major satellites can be seen with opera-glasses.

**SATURN:** is several degrees north-east of Antares, in the constellation Ophiuchus. It rises about three hours after sunset, and reaches the meridian before dawn. Still, technically, a morning star, it becomes better placed daily. On the 15th, distance is 867 million miles, magnitude is 0.5, and the apparent diameter of the ring system is 40". The rings are open about at their widest as seen from the earth, and are a beautiful sight. A small telescope will reveal them.

**URANUS:** this faint planet is still well-placed for observation, even though long past opposition. It is close to the "Bee Hive" in Cancer. It can just be seen with the naked eye on a moon-less night; 50 power on a telescope will reveal a tiny disc. Distance the 15th is 1705 million miles.

**NEPTUNE:** is in Virgo all month, about 10° east of Spica. It comes to opposition the 21st, but since its magnitude is only 7.7, optical aid is necessary to see it. Its disc is about 2 1/2" in diameter, large enough to show up under 100 power on the telescope. The previous issue of the "MAP" contains a detailed chart of Neptune's positions and should simplify identification. It is closest to the earth the 22nd at 2724 million miles.

## ASTRONOMICAL CALENDAR

Eastern Standard Time

APRIL, 1957

April	1— 4:15 am	Minimum of Algol
	1— 6:58 am	Conjunction, Mercury and Moon; Mercury south 1° 50'
	3—12:— am	Mercury in perihelion
	4— 1:04 am	Minimum of Algol
	4—10:41 pm	Conjunction, Mars and Moon; Mars north 3° 9'
	6— 9:53 pm	Minimum of Algol
	8— 7:28 pm	Conjunction, Uranus and Moon; Uranus north 5° 47'
	9— 6:42 pm	Minimum of Algol
	10— 6:— am	Uranus stationary in Right Ascension
	12— 9:02 am	Conjunction, Jupiter and Moon; Jupiter north 6° 15'
	12— 3:31 pm	Minimum of Algol
	13— 6:— am	Mercury greatest heliocentric latitude north
	14— 8:— am	Superior conjunction, Venus and Sun; Venus south 1° 7'

14— 9:13 pm	Conjunction, Neptune and Moon; Neptune north $3^{\circ} 34'$
15— 4:— am	Mercury greatest elongation east, $19^{\circ} 45'$
15—12:20 pm	Minimum of Algol
17— 9:41 pm	Conjunction, Saturn and Moon; Saturn south $0^{\circ} 18'$
18— 9:09 am	Minimum of Algol
21— 5:59 am	Minimum of Algol
21—10:— am	Opposition, Neptune and Sun
23— 4:— am	Quadrature, Uranus and Sun
24— 2:48 am	Minimum of Algol
25—10:— am	Mercury stationary in Right Ascension
26—11:37 pm	Minimum of Algol
29— 8:26 pm	Minimum of Algol
29—	Annular eclipse of the Sun
30— 3:53 am	Conjunction, Venus and Moon; Venus south $1^{\circ} 12'$
30—10:25 am	Conjunction, Mercury and Moon; Mercury north $1^{\circ} 34'$

(continued from page 3)

Some of these things are easy to see, others very difficult. If you have been looking at photographs or drawings in an astronomical book, or worse still, some of the

imaginative paintings of the appearances of other worlds, then you will be most disappointed if you expect the telescope to show you these things immediately. The photographs have probably been taken with giant instruments, and in any case the photographic plate can record things that the eye will never see through any instrument no matter how large. Good drawings are probably the result of work performed by a skilled observer who has awaited the best conditions to undertake the task; or they may even be composite drawings made from several observations for the purpose of illustration. Imaginative drawings are often produced by artists using half knowledge and half sheer imagination, which could quite likely be wrong. On the other hand, if some little thought has been given to such photographs and drawings they can assist you to appreciate more fully what you see.

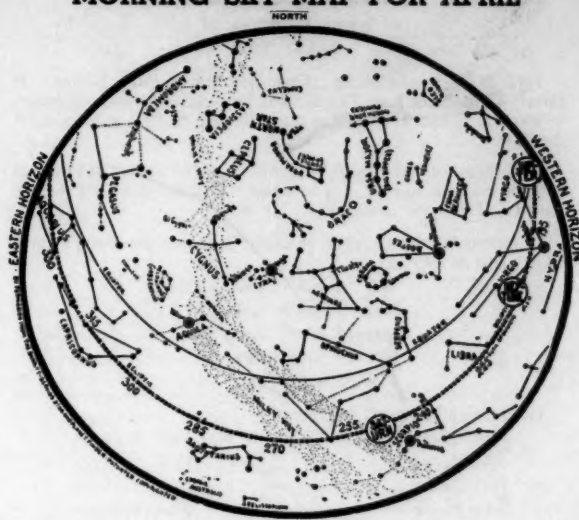
The Earth's atmosphere is the enemy of astronomers who wish to peer out into space. In this great gaseous ocean there are continually varying temperatures and densities which produce a shimmering effect. Astronomers call it "boiling." You have seen this when looking out at a distant scene on a hot summer's day, and everything seems to tremble and dance in the heat haze. When you leave the Observatory, have a look at the lights of Petone from Kelburn, and you will see them twinkling like stars. When "boiling" is present the telescope magnifies it, as well as the object, and all detail is lost. This is the fault of the telescope, and nothing can be done about it, except travel with the instruments to the top of a high mountain. That is why many American observatories are on mountain tops.

Lastly, if it is cloudy, be assured the telescope has no magic power of penetrating those clouds. There is a lot of idle talk about using infra-red or radar; but while this might be a thing of the future, it is certainly not a technique of the present for telescopes to overcome the obstruction of clouds.

If the demonstrator says that the night is not suitable for the telescope, he is being honest; for if there is the slightest hope he is only too eager to have it in operation. It must be admitted, however, that the weather often clears up just as one is going home, and this seems to be a favourite prank of Nature. If the weather does disappoint you once, remember that the astronomer has suffered thus, hundreds of times.

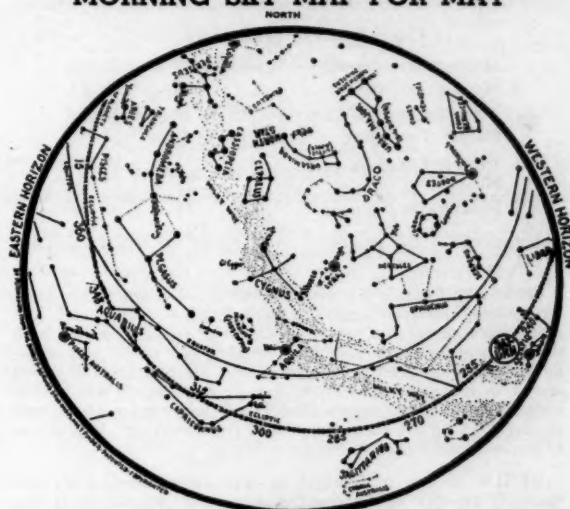
*Astronomical Bulletin No. 44, Carter Observatory  
Wellington, New Zealand*

## MORNING SKY MAP FOR APRIL



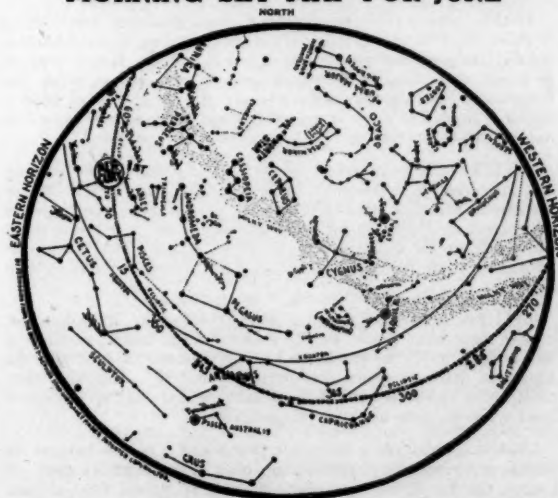
At 5:00 A.M., April 1; 4:00 A.M., April 15; 3:00 A.M., April 30

## MORNING SKY MAP FOR MAY



At 5:00 A.M., May 1; 4:00 A.M., May 15; 3:00 A.M., May 31

## MORNING SKY MAP FOR JUNE



At 5:00 A.M., June 1; 4:00 A.M., June 15; 3:00 A.M., June 30

## AMATEUR'S FORUM

BY IRVING L. MEYER, M. S.

MAY, 1957

**THE SUN:** continues its climb into the northern heavens. It travels from Aries into Taurus, and geocentric distance continues to increase—from 93.6 million miles the 1st, to 94.2 million miles the 31st.

**THE MOON:** is at perigee (closest to the earth) the 8th at 229,000 miles distance; it is at apogee (farthest from the earth) the 21st at 251,000 miles.

**Libration:** Maximum exposure of the region on the Moon's limbs takes place as follows:

May 1 East limb, 5.2°  
May 7 North limb, 6.8°  
May 15 West limb, 5.0°  
May 21 South limb, 6.9°  
May 28 East limb, 5.4°

**The Moon's Phases (E.S.T.):**

First Quarter May 6 at 9:29 pm  
Full Moon 13 at 5:34 pm  
Last Quarter 21 at 12:03 pm  
New Moon 29 at 6:39 am

There will be a total eclipse of the Moon on the 13th, visible best from Europe, western Asia, and Africa. It will be visible to some extent in the eastern part of No. America and So. America.

### CIRCUMSTANCES OF THE ECLIPSE:

Moon enters penumbra May 13 at 2:42 pm  
Moon enters umbra 13 at 3:45 pm  
Total eclipse begins 13 at 4:52 pm  
Middle of eclipse 13 at 5:31 pm  
Total eclipse ends 13 at 6:10 pm  
Moon leaves umbra 13 at 7:17 pm  
Moon leaves penumbra 13 at 8:20 pm

Magnitude of the eclipse is 1.304, where the Moon's diameter is 1.0.

**MERCURY:** spends the entire month in the constellation Aries, retrograding most the month. At the beginning of the month it is in the evening sky; on the 5th it is in inferior conjunction with the Sun, and thereupon enters the morning sky. By the end of the month it reaches greatest elongation from the Sun and can be observed in the morning twilight, low in the east. It will not be exceptionally bright (magnitude 0.9) but will not be too difficult an object. In the telescope, it will look crescent-shaped. It is closest to the earth the 8th at 52 million miles.

**VENUS:** is now in the evening sky, moving from Aries into Taurus. Too close to the Sun for satisfactory observation, it can, nevertheless, be detected toward the end of the month in the bright twilight glow shortly after sunset. Distance the 1st is 160 million miles, decreasing to 156 million miles by the 31st.

**MARS:** moves from the Taurus-Gemini boundary into central Gemini, high in the northern heavens. Receding from the earth steadily, it consequently continues to lose brightness. It now is about as bright as a standard second magnitude star, and is pretty unimpressive. Though still in the evening sky, its period of observability is limited to a few hours after sunset. Distance the 1st is 198 million miles, increasing to 217 million miles on the 31st.

**JUPITER:** the brightest, most spectacular planet in the evening sky, continues to hold sway in Virgo. This, the largest of the planets, is the most readily observable of all—even opera glasses will reveal its disc. Also for opera glasses are the four bright satellites; consult the charts given elsewhere in the "MAP". On the 15th, magnitude is -1.8, diameter 40", and distance is 455 million miles.

**SATURN:** is entering the scene of the evening sky. In Ophiuchus, it rises right after sunset. At the middle of the month, distance is 841 million miles, magnitude 0.3, ring diameter is 41", and the equatorial diameter of the disc itself is about 18". The wide open rings are a splendid sight with modest optical aid; as seen in a large telescope they are truly magnificent.

**URANUS:** basically a telescopic object which at best borders on naked-eye visibility, this planet rides high in the northern skies, in Cancer. On the 15th its geocentric distance is a great 1751 million miles. It is in the evening sky, setting shortly before midnight.

**NEPTUNE:** is also an evening sky object all month, in Virgo. It is well placed for observation, but at magnitude 8 does not make an impressive sight in any but large telescopes. Distance from the earth the 15th is 2731 million miles.

## ASTRONOMICAL CALENDAR

Eastern Standard Time

MAY, 1957

May 2—11:— am	Conjunction, Mercury and Venus; Mercury north 1° 49'
2— 5:15 pm	Minimum of Algol
3— 1:07 pm	Conjunction, Mars and Moon; Mars north 4° 40'
5— 2:04 pm	Minimum of Algol
5—	Transit of Mercury
5— 7:— pm	Inferior conjunction, Mercury and Sun; Mercury north 0° 15'
6— 1:36 am	Conjunction, Uranus and Moon; Uranus north 5° 52'
6— 5:— pm	Mercury in descending node
8—10:53 am	Minimum of Algol
9— 1:39 pm	Conjunction, Jupiter and Moon; Jupiter north 6° 19'
11— 7:42 am	Minimum of Algol
12— 5:09 am	Conjunction, Neptune and Moon; Neptune north 3° 39'
13—	Total eclipse of the Moon
14— 4:31 am	Minimum of Algol
15— 4:20 am	Conjunction, Saturn and Moon; Saturn south 0° 10'
16— 6:— pm	Venus in ascending node
17—12:— am	Mercury in aphelion
17— 1:20 am	Minimum of Algol
18— 2:— am	Mercury stationary in Right Ascension
19—11:— am	Jupiter stationary in Right Ascension
19—10:09 pm	Minimum of Algol
22— 6:58 pm	Minimum of Algol
25— 3:46 pm	Minimum of Algol
27—11:58 am	Conjunction, Mercury and Moon; Mercury south 4° 24'
28—12:35 pm	Minimum of Algol
30— 4:56 am	Conjunction, Venus and Moon; Venus north 3° 15'
31— 9:24 am	Minimum of Algol

## SATELLITES OF JUPITER

APRIL

Day	West	East
1	3. 0 -1	-4
2	3. 1 0	-2 -4
3	-3 0 2 -1	-4
4	2. -1 0 3	-4
5	0 1. -3	4. -2 ●
6	-1 0 2. 3. 4.	
7	2. 1 0. 3. 4.	
8	-2 3. 1 0.	-1 ●
9	3. 4. 1. 0. -2	
10	4. -3 0 2.	
11	4. 2. 1. -3 0	
12	4. 0 1. -3	-2 ●
13	-4 -1 0 2. -3	
14	-4 2. 0 1. 3.	
15	-4 -2 3. 0	-1 ●
16	3. -4 1. 0 -2	
17	-3 0 -4	
18	2. 3 0 -4	
19	-2 0 -1 -4	
20	-1 0 -2 -3 -4	
21	2. 0 1. 3. 4.	
22	0 3. -2 -1 0	4.
23	0 1. 3. 0 -2 4.	
24	-3 0 -1 2.	
25	3. 1. 4. 0	
26	4. -2 0 -3	
27	4. -1 0 -2 -3	
28	0 2. 4. 0 1. 3.	
29	-4 -2 -1 0 3.	
30	-4 3. 1 0. -2	

Appearance of Jupiter and its satellites  
at 12:15 A.M., E.S.T.  
as seen in an inverting telescope

## AMATEUR'S FORUM

BY IRVING L. MEYER, M. S.

JUNE, 1957

**THE SUN:** once again the Sun is moving over the most northerly portion of the ecliptic, as it moves from Taurus into Gemini. The distance between the earth and the Sun increases from 94.2 million miles the 1st, to 94.4 million miles the 30th.

**THE MOON:** is closest to the earth (*perigee*) twice during June — on the 2nd at 229,000 miles, and the 30th at 226,000 miles; it is farthest from the earth (*apogee*) the 18th at 251,000 miles.

**Libration:** Maximum exposure of the region on the Moon's limbs takes place as follows:

June 3 North limb, 6.7°

June 11 West limb, 4.8°

June 17 South limb, 6.8°

June 25 East limb, 6.3°

The Moon's Phases (E.S.T.):

First Quarter June 5 at 2:10 am

Full Moon 12 at 5:02 am

Last Quarter 20 at 5:22 am

New Moon 27 at 3:53 pm

**MERCURY:** is in the morning sky the entire month, racing from Aries, through Taurus, into Gemini. Greatest elongation from the Sun occurs on the 1st, making the planet observable as a close-to-the-horizon star as dawn breaks. Mercury is not really difficult to observe, but the observer must have an unrestricted view to the horizon. Elongations of this planet vary by as much as about 10°, but, unfortunately for northern hemisphere observers, all the better elongations (such as this one) favor the observer south of the equator. Distance from the earth increases during the month from 74 million miles the 1st, to 121 million miles the 30th.

**VENUS:** is now observable in the evening sky, improving in relation to the Sun with each passing day. It moves from Taurus, through Gemini, to the Cancer border, and in so doing comes within less than 10° of catching up with Mars. Venus shines at magnitude -3.3 all month—an exceedingly brilliant planet. In the telescope it appears nearly full, averaging about 95% illuminated. Distance is slowly decreasing—from 156 million miles the 1st, to 147 million miles the 30th.

**MARS:** the planet that was a brilliant, exciting spectacle last year, has been reduced by distance to a nonentity. In the evening sky, it sets shortly after the Sun. It is much too remote for worthwhile observation. Distance continues to increase; from 218 million miles to 232 million miles during June. It moves from Gemini into Cancer, and is only a little over 1/2° north of Uranus on the 29th.

**JUPITER:** remains in Virgo, a few degrees north of the equator. This is still a bright and interesting planet, though it too is receding from the earth. Jupiter's geocentric distance increases from 479 to 520 million miles during the month. Probably the most fascinating of Jupiter's attractions is its four bright satellites. Even the opera glass will reveal them; and a few hours will show their motion in relation to each other and to their primary.

**SATURN:** northeast of Antares, Saturn moves very slowly in Ophiuchus. It is in opposition to the Sun the 1st, and at that time is closest (857 million miles) and brightest (magnitude 0.2). This is one of the brightest oppositions, because the rings are very widely open as seen from the earth. On the 1st, the ring diameter is 41.7", with the northern surface opened 26° toward the earth. Even a small telescope shows them readily; with 200 power they are magnificent. Titan, the brightest satellite, is easy to pick out, though it revolves at a pretty great distance from the planet.

**URANUS:** no longer suitable for observation, as it is faint, sets only a few hours after the Sun. In Cancer all month. Distance the 15th is 1790 million miles.

**NEPTUNE:** is well placed in the evening sky, in Virgo. It cannot be detected with the naked eye, but can be seen with the smallest telescope, or powerful binoculars. Refer to the previous issue of the "MAP" for detailed instructions on locating this planet. Distance the 15th is 2760 million miles.

## ASTRONOMICAL CALENDAR

Eastern Standard Time

JUNE, 1957

June 1— 3:50 am Conjunction, Mars and Moon; Mars north 5° 48'

1— 2:— pm Opposition, Saturn and Sun

1— 6:— pm Mercury greatest elongation west, 24° 28'

## SATELLITES OF JUPITER

MAY

Day	West		East
1		4 3 1	0
2		2 0 4	1 -3 0
3		1 0	2 3
4		0 2 1	3 4
5		2 1 0	3 4
6		3 0 1	4 2 0
7		3 0 1	2 4
8	0 1	3 2 0	4
9		2 0 3 1	4
10		1 0 4	2 3
11		4 0 2 1	3
12		4 2 1 0	3
13		4 3 0 1	2 0
14	4	3 1 0	2
15	0 1	4 3 2 0	
16		4 2 0 3	1 0
17		4 1 0	2 3
18		4 1 0 3	3
19		2 1 0 4	3
20		3 0 2 1	4
21		3 1 0	2 4
22		3 2 0 1	4
23		2 3 0	4 1 0
24		1 0 2 3	4
25		0 1 3 4	
26		2 1 0	4
27		3 1 0 1	
28		3 4 1 0	2
29	0 2	4 3 0 1	
30	4	2 3 0 1	
31	0 1	4 0 2 3	

Appearance of Jupiter and its satellites  
at 11:30 P.M., E.S.T.  
as seen in an inverting telescope

Jupiter is represented by the disc in the center of the chart, and each satellite by a dot and its appropriate number. The direction of the satellite's motion is from the dot toward the numeral. The numeral. The numeral and light disc at the left margin of the chart indicates a satellite in transit across Jupiter's disc; the numeral and dark disc at the right margin indicates a satellite which is invisible because it is being eclipsed or occulted by Jupiter. This chart must be held upside down if binoculars, opera glasses, or an erecting type telescope is used.

2— 8:53 am Conjunction, Uranus and Moon; Uranus north 5° 51'

3— 6:13 am Minimum of Algol

5— 7:47 pm Conjunction, Jupiter and Moon; Jupiter north 6° 8'

6— 3:02 am Minimum of Algol

6— 7:— am Mercury greatest heliocentric latitude south

8— 11:06 am Conjunction, Neptune and Moon; Neptune north 3° 39'

8— 11:51 pm Minimum of Algol

11— 8:57 am Conjunction, Saturn and Moon; Saturn 0° 0'

11— 8:39 pm Minimum of Algol

13— 11:— pm Quadrature, Jupiter and Sun

14— 5:28 pm Minimum of Algol

17— 2:17 pm Minimum of Algol

19— 3:— pm Venus in perihelion

20— 11:06 am Minimum of Algol

21— 11:21 am Sun enters the sign of Cancer; Solstice

23— 7:54 am Minimum of Algol

24— 4:— am Mars greatest heliocentric latitude north

25— 8:— am Mercury in ascending node

26— 4:43 am Minimum of Algol

27— 12:33 am Conjunction, Mercury and Moon; Mercury north 3° 28'

29— 1:32 am Minimum of Algol

29— 5:36 am Conjunction, Venus and Moon; Venus north 6° 24'

29— 6:— pm Conjunction, Mars and Uranus; Mars north 0° 40'

29— 6:41 pm Conjunction, Uranus and Moon; Uranus north 5° 46'

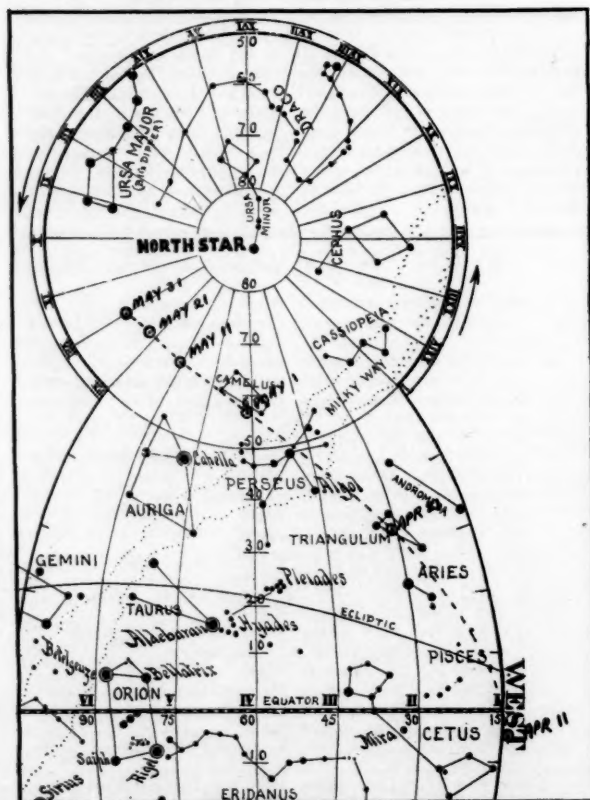
29— 6:44 pm Conjunction, Mars and Moon; Mars north 6° 26'

29— 11:— pm Mercury in perihelion

## COMET AREND - ROLAND (1956h)

On November 20, 1956, Harvard College Observatory announced to this country the discovery by Arend and Roland of a 10th magnitude comet in the constellation Triangulum. At this time this appeared to be a routine discovery—another faint comet destined to get perhaps a little brighter, then fade into obscurity. It was, therefore, something of a bombshell when Dr. Merton of Oxford announced that on the basis of Candy's new orbit computation the comet appeared likely to become brilliant.

The orbital elements are indeed interesting. Perihelion is at a distance of  $29\frac{1}{2}$  million miles from the Sun—about the same distance as Mercury's perihelion. While comets don't generally behave as well as planets in being predictable as to brightness, it is a fact that the closer a comet comes to the Sun, the brighter it becomes. Since 1956h is to come very close, it is predicted, based on the regular cometary formulas, that its magnitude near the middle of April will be -1. This would make it almost as bright as Jupiter. Unfortunately, at this time the comet will pass between the earth and the Sun. But observers in the southern hemisphere should be able to pick it up in the morning sky the first part of April, while northern observers will have their chance after sunset in the evening sky toward the end of April and early May. In any event, despite the twilight effect, it should be a naked eye comet.



PATH OF COMET AREND-ROLAND (1956h)

The chart shows the comet's rapid dash into the northern circumpolar region, subsequent to perihelion passage on April 8th. Positions are for 7 pm (EST) of the dates given.

## TIME CHANGES OLD AND NEW

BY W. S. McCLENAHAN

THE expression "How Times Change" is not new. Officials employed in a national time service may think this should be altered to read "How Time Changes".

Changes in recording the passage of time can be noted in the development of the calendar. The Egyptian calendar is an example of a method of recording the passing years in which each year consisted of 12 months of 30 days, with 5 added days. Even then it was noted from the heliacal rising of Sirius that the natural year was about 365.25 days in length and the Egyptians realized that their three seasons, designated, Flood Time, Seed Time, Harvest Time, would gradually drift in the calendar year, requiring 1,461 calendar years before the seasons would return to the same part of the calendar year again.

Up to the time of the calendar reform by Julius Caesar, this appears to have been the only civil calendar in which the length of each month and each year was fixed by rule. Previously these were fixed by direct observation or left to a decision by an individual.

Other calendars such as those used by the Babylonians and the Greeks, had the beginnings of the months fixed by observation of the lunar crescent and consisted of twelve months. In order to keep the months closely related to the seasons of the year, one month was repeated when required.

Our present-day calendar is the result of changes made in the Roman calendar. The insertion of days and months had been neglected to such an extent that Caesar caused sixty-seven days to be added in the year 46 B.C. to get things straightened out again. The length of the year being approximately 365.25 days was allowed for by an edict to have an extra day inserted every fourth year. Apparently time problems were as confusing in those days as they are at present and through a misunderstanding the pontifices put in an extra day every three years. By 8 B.C. the calendar was again off the track by three days. This was painlessly corrected by abolishing leap years till A.D. 8.

Pope Gregory XIII introduced the next change in the Julian calendar by a bull published in 1582. The reason for the change at this time was to restore the vernal equinox to the position given it in the Easter Tables formulated at the General Council of Nice in 325, namely March 21. The necessity for the revision came from assuming the length of the year to be 365.25 days whereas the correct value is 365.2422. By 1582 the vernal equinox was on March 11 instead of March 21. The Julian year was 0.00078 or about 11 minutes too long, and from 325 to 1582 it is easy to calculate that this difference accumulated to the tidy sum of ten days. The adjustment was made on October 4, 1582, by calling the following day October 15 instead of October 5. To guard against a similar difficulty in the future only century years divisible by 400 were to be treated as leap years. Without this proviso by 1950 the vernal equinox would be out of step by approximately 3 days. This is allowed for very closely since 1700, 1800 and 1900 are not divisible by 400 and were not leap years. No changes have been made to this calendar since 1582.

History records the difficulties and delays in having the Gregorian calendar adopted throughout the world. It was not adopted in England until September 1752, and even then aroused bitter opposition and riots in which several persons were killed at Bristol. In recent years Calendar Reform is again a live topic and another change is not impossible.

The above remarks have to do with the recording of the passage of time. What about the unit of time? As a time standard either the mean second, which is 1/86400 part of a mean solar day, which in turn is the average length of all the days in a year, or the sidereal second which is 1/86400 part of a sidereal day, is being used. In either case if the rotation of the earth on its axis has changed, then the unit of time has changed.

Investigations have revealed changes in the longitudes of the Sun, Mercury and Venus, that are similar to fluctuations in the longitude of the Moon. A variation in the unit of time is blamed for these similar discrepancies between computed and observed positions and two causes may contribute to this variation: (1) A gradual slowing down of the rotation of the earth results from tidal friction in narrow seas. (2) If masses of material are displaced in the earth the moment of inertia will be changed and consequently the earth might speed up or slow down according as the moment of inertia is lessened or increased by such action.

In 1939 Sir Harold Spencer Jones investigated the above differences and concluded that these variations in longitude for the Sun, Mercury and Venus were proportional to their mean motions and are similar to fluctuations in the longitude of the Moon.

The above two possible causes of the erratic rotation of the earth have different effects on the Sun and planets, than on the Moon. Suppose a mass of material in the earth has moved farther out from the axis of rotation. This will cause the earth to slow down, consequently the Sun, Moon and planets will all appear to be ahead of their computed places by the same amount of time.

Tidal friction which tends to slow down the earth, causes also a change in the orbital motion of the Moon. Since the tidal wave results from the attraction of the Moon, it in turn attracts and tends to accelerate the Moon's motion. This causes the Moon to recede from the earth and changes its period of revolution. Tidal friction has no direct effect on the Sun or the planets.

The discrepancies between the observed and computed positions of the Sun, Mercury and Venus have indicated that the length of the day has been slowly increasing at the rate of one millisecond (0.001) per century, the cause being the effect of tidal friction. From the performance of the more accurate quartz-crystal clocks, it is now well established that there is also a short-term period in the variation of the earth's rotation.

Some years ago when the Shortt Free Pendulum clock first came into use, the greater uniformity of its rate over the previous pendulum clocks resulted in a change being made in the determination of clock corrections. When such corrections were plotted, the effect of nutation on the first point of Aries was quite apparent. Naturally a clock with a uniform rate could not follow the irregular motion of this reference point from which all star right ascensions are measured. For this reason uniform sidereal time was adopted, in which the nutation in right ascension is removed from the observed clock corrections. This came into effect January 1, 1936, the correction amounting to approximately one second of time.

This change seemed to answer current needs for a revision of a time unit until the quartz crystal clocks came into use. Their very accurate performance indicated a variation that could only be explained by a rotation of the earth which was slower than average in the first part of the year and faster in the last half of the year. The earth stands condemned as a master clock which is unable to provide a uniform time standard.

At the eighth General Assembly of the International Astronomical Union held in Rome, September, 1952, the following resolution was adopted:

"It is recommended that, in all cases where the mean solar second is unsatisfactory as a unit of time by reason of its variability, the unit adopted should be the sidereal year at 1900.0; that the time reckoned in these units be designated "Ephemeris Time"; that the change of mean solar time to ephemeris time be accomplished by the following correction:

$$T = +24.8349 + 72.5318T + 29.950T^2 + 1.82144 \dots B$$

where  $T$  is reckoned in Julian centuries from January 0, 1900, Greenwich mean Moon, and  $B$  has the meaning given by Sir Harold Spencer Jones in *Monthly Notices R. A. S.*, vol. 99, p. 541, 1939; and that the above formula define also the second. No change is contemplated or recommended in the measure of Universal Time, nor in its definition."

The mean solar second is unsatisfactory for use in the national ephemerides since theory assumes time as invariable when computing the positions of the Sun, Moon and planets. A further I.A.U. resolution stated that Ephemeris Time would not be introduced until 1960.

It was later pointed out by Prof. A. Danjon of the Paris Observatory that the tropical year is a more fundamental unit. Its length is derived from Newcomb's tables of the Sun while the length of the sidereal year is dependent on an adopted value of the constant of precession.

The Committee of Weights and Measures at its meeting in September, 1954, adopted the following definition of the fundamental and invariable unit of time: "The second is the fraction 1/31556925.975 of the tropical year for 1900.0."

The Sun's mean longitude according to Newcomb's table is:

$$279^\circ 41' 48''.04 + 129602768''.13T + 1.089T^2$$

where  $T$  is in Julian centuries measures from the epoch 1900 January 0.0.

If, then, the  $T$  is a changing quantity, a difference will show up between observed and computed values of the mean longitude. It was these differences in the case of the Sun, Moon and planets that were examined by Sir Harold Spencer Jones and led to the following correction to the Sun's mean longitude:

$$1''.00 + 2''.97T + 1''.23T^2 + 0.074804 \dots B$$

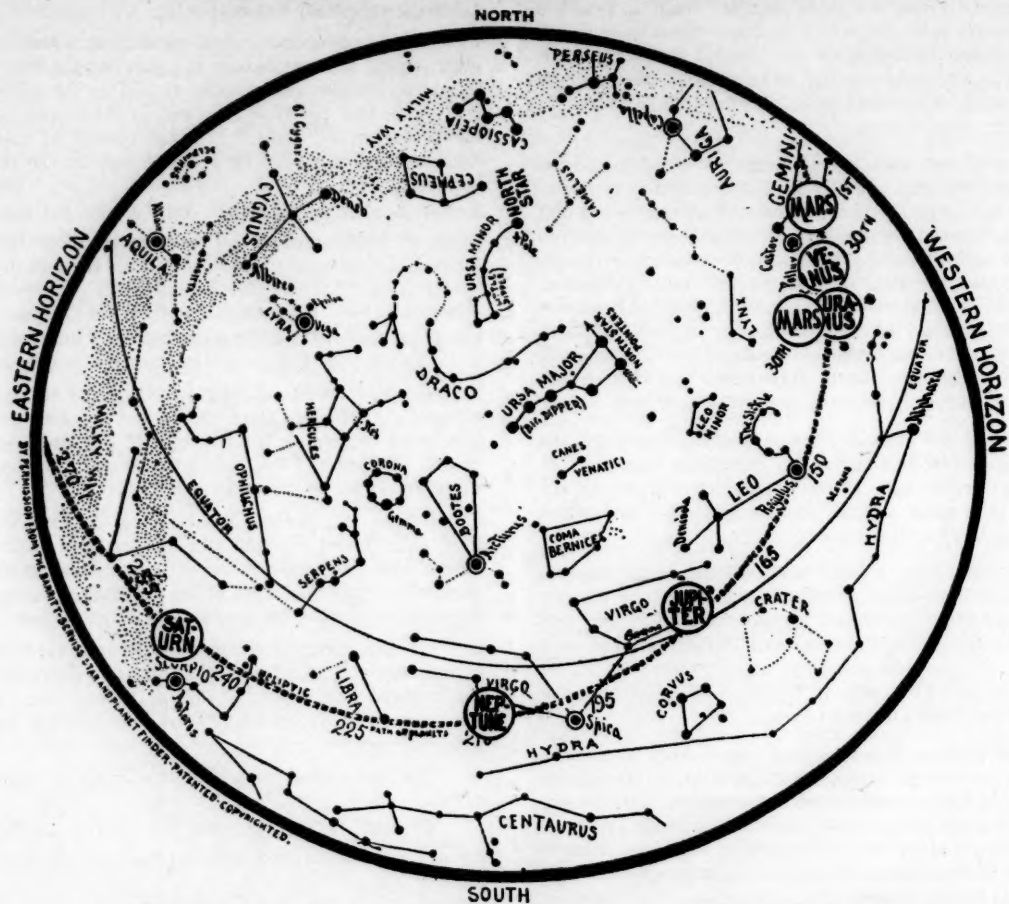
The reason for using  $B$ , a fluctuation in the Moon's longitude, is because the Moon has the fastest motion. For instance, the Sun moves only one degree per day whereas the Moon moves in its orbit about  $13^\circ$  per day. The variation in the rate of rotation of the earth is much easier to detect on the basis of discrepancies between observed position and computed position in the Moon's longitude.

The correction  $T$  comes from this equation. It can be found by a simple calculation since the Sun moves  $360^\circ$  in 365.25 days it will change  $1''.00$  in 24.8349. At first one might expect the  $T$  to be zero for 1900.0, whereas the  $T$  is:  $24.8349 + 1.82144B$ .  $B$  is given as approximately  $-16''$  for 1900 so the correction  $T$  is approximately  $-4$  seconds of time.

What will happen in 1960? Opinion is divided as to whether clocks should be adjusted to indicate Ephemeris Time. If this is done it will mean a correction of  $+35$  seconds approximately. Such a change could be absorbed into everyday life with very little notice. The fundamental ephemeris of the Sun, Moon and planets will all be tabulated with ephemeris time as argument and the *Improved Lunar Ephemeris* 1952-59 has already been issued.

—Journal of The Royal Astronomical Society of Canada, No. 424

# EVENING SKY MAP FOR JUNE



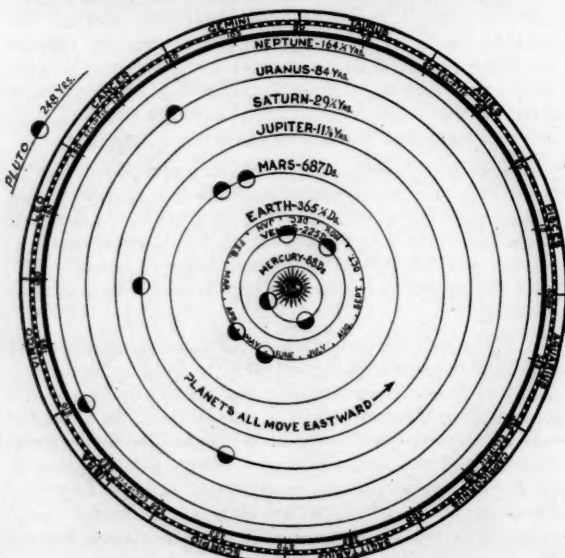
AT 9:30 P.M., JUNE 1

8:30 P.M., JUNE 15

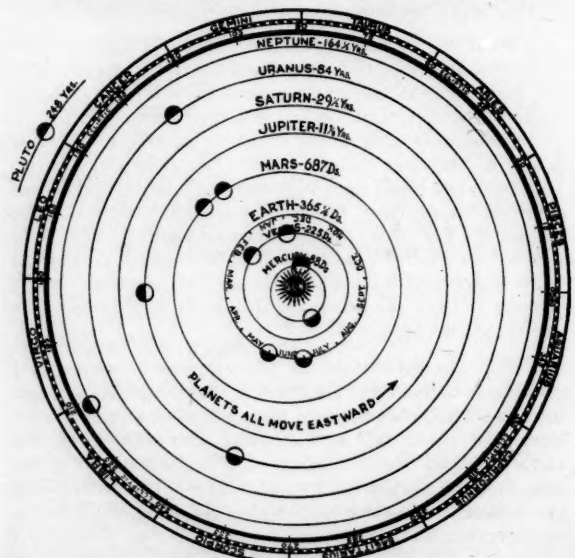
7:30 P.M., JUNE 30

Face South and hold the Map overhead, the top North, and you will see the stars and planets just as they appear in the heavens. The arrow through the two stars in the bowl of the Big Dipper points to the North Star, the star at the end of the handle of the Little Dipper. This map is arranged specifically for Latitude 40 North—New York—but is practical for ten or fifteen degrees north or south of this latitude anywhere in the United States, the southern portion of Canada and the northern portion of Mexico and for corresponding latitudes in Europe.

## HELIOCENTRIC POSITIONS OF THE PLANETS, MAY



## HELIOCENTRIC POSITIONS OF THE PLANETS, JUNE

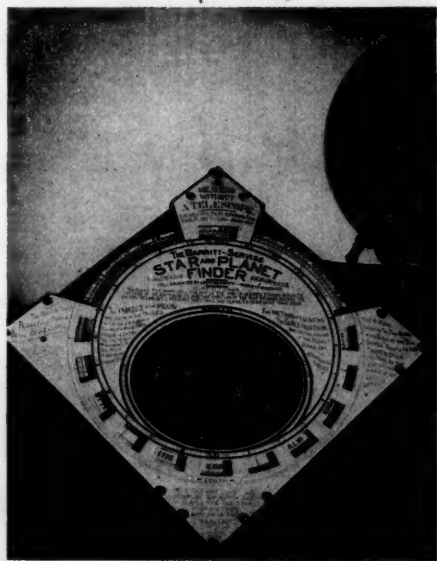


## SATELLITES OF JUPITER

Day	West	East
1	-4	○ -1 2 <sup>+</sup> -3
2	-4	2 <sup>+</sup> 1 <sup>+</sup> ○ 3 <sup>+</sup>
3	○ 3 <sup>+</sup>	-4 ○ -2 ○ -1
4		3 <sup>+</sup> -1 <sup>+</sup> ○ -2
5	-3	○ 2 <sup>+</sup> -1 <sup>+</sup>
6		2 <sup>+</sup> -3 -1 ○ -4
7		1 ○ -3
8		○ 2 <sup>+</sup> -3 -4
9		2 <sup>+</sup> 1 <sup>+</sup> ○ 3 <sup>+</sup> 4 <sup>+</sup>
10		-2 ○ 3 <sup>+</sup> -1 4 <sup>+</sup>
11		3 <sup>+</sup> 1 <sup>+</sup> ○ -2 4 <sup>+</sup>
12	-3	○ 2 <sup>+</sup> 1 <sup>+</sup> 4 <sup>+</sup>
13		2 <sup>+</sup> -1 <sup>+</sup> ○
14		4 <sup>+</sup> ○ 1 <sup>+</sup> -2 ● 3 ●
15	4 <sup>+</sup>	○ 2 <sup>+</sup> -3 -1 ●
16	4 <sup>+</sup>	2 <sup>+</sup> 1 <sup>+</sup> ○ 3 <sup>+</sup>
17	4 <sup>+</sup>	-2 ○ -1 <sup>+</sup>
18	-4	3 <sup>+</sup> 1 <sup>+</sup> ○ -2
19	-4 3 <sup>+</sup>	○ -1 <sup>+</sup>
20	-1 <sup>+</sup> 3 <sup>+</sup> -1	○
21		-1 <sup>+</sup> ○ 3 <sup>+</sup> 1 <sup>+</sup>
22		-1 ○ -4 -2 -3
23	○ 1 <sup>+</sup>	2 <sup>+</sup> ○ 3 <sup>+</sup> -4
24		-2 ○ -1 3 <sup>+</sup> -4
25		3 <sup>+</sup> 1 <sup>+</sup> ○ -2 -4
26	3 <sup>+</sup>	○ -1 <sup>+</sup> 4 <sup>+</sup>
27	-3 2 <sup>+</sup> -1	○ 4 <sup>+</sup>
28		-2 <sup>+</sup> ○ 3 <sup>+</sup> 1 <sup>+</sup> 4 <sup>+</sup>
29		-1 ○ -1 <sup>+</sup> -2 <sup>+</sup>
30	○ 2 <sup>+</sup>	4 <sup>+</sup> ○ 1 <sup>+</sup> 3 <sup>+</sup>

**Appearance of Jupiter and its satellites  
at 10:45 P.M., E.S.T.  
as seen in an inverting telescope**

## THE BARRITT-SERVISS STAR and PLANET FINDER



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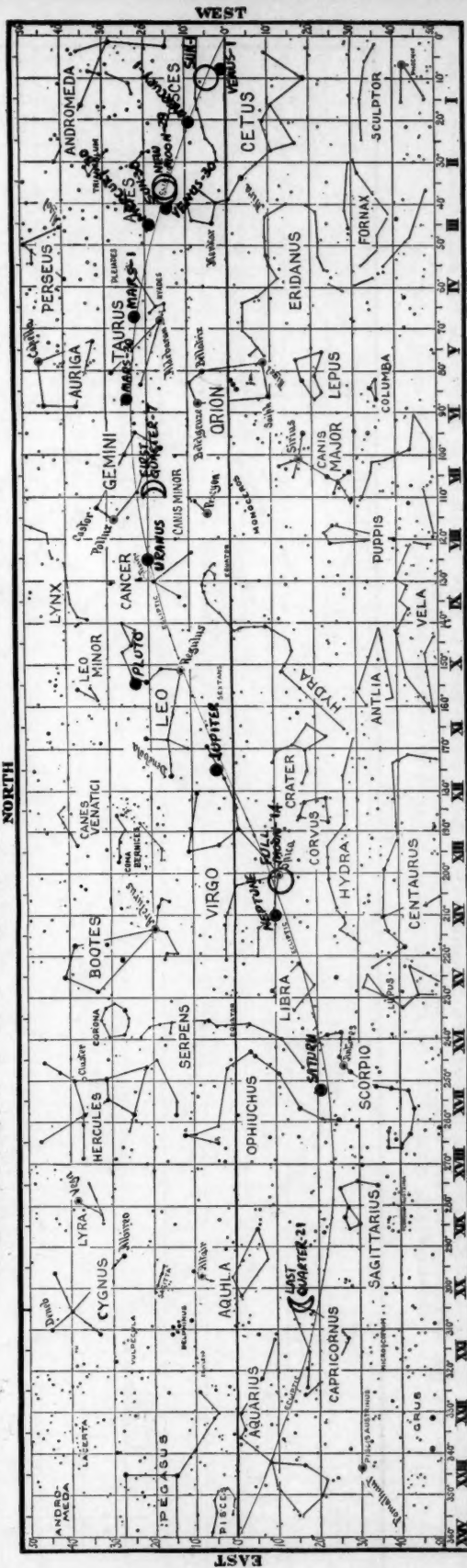
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**A MERCATOR PROJECTION OF THE STAR FIELD FOR 50° NORTH AND 50° SOUTH OF THE EQUATOR**

The Star Field makes an apparent complete revolution westward every 24 hours, hence the hourly division from I to XXIV, but this has no relation to the time that any portion of the map is in view. Practical as a Star, Constellation and Planet Finder for the current month—April, 1957—Anywhere in the world.

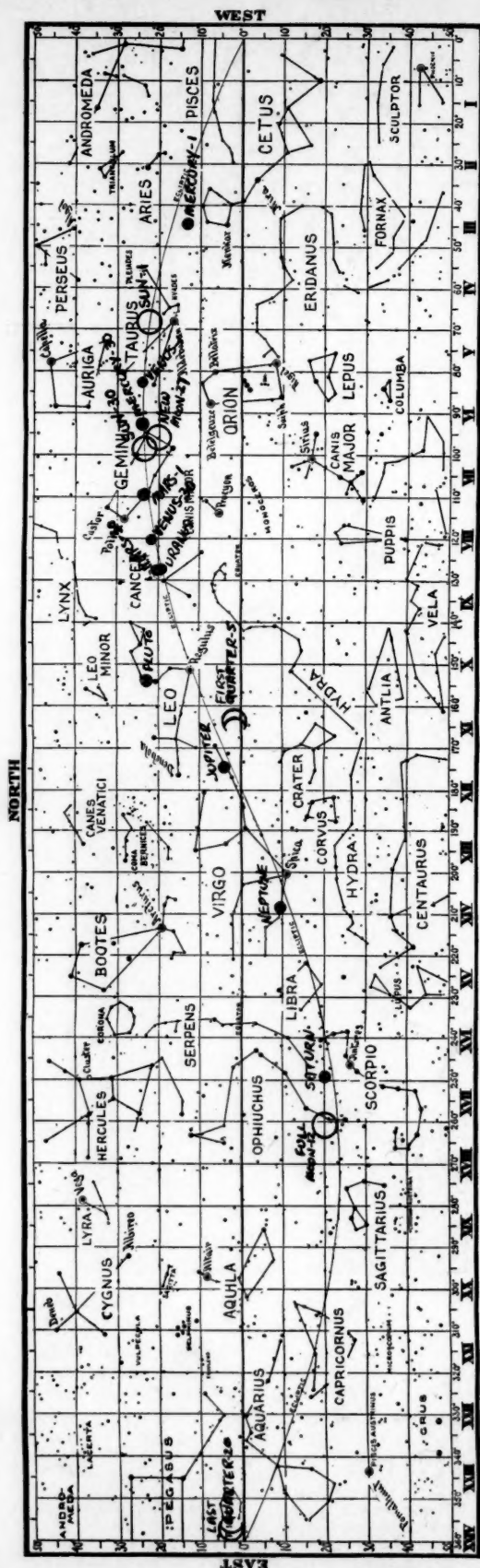
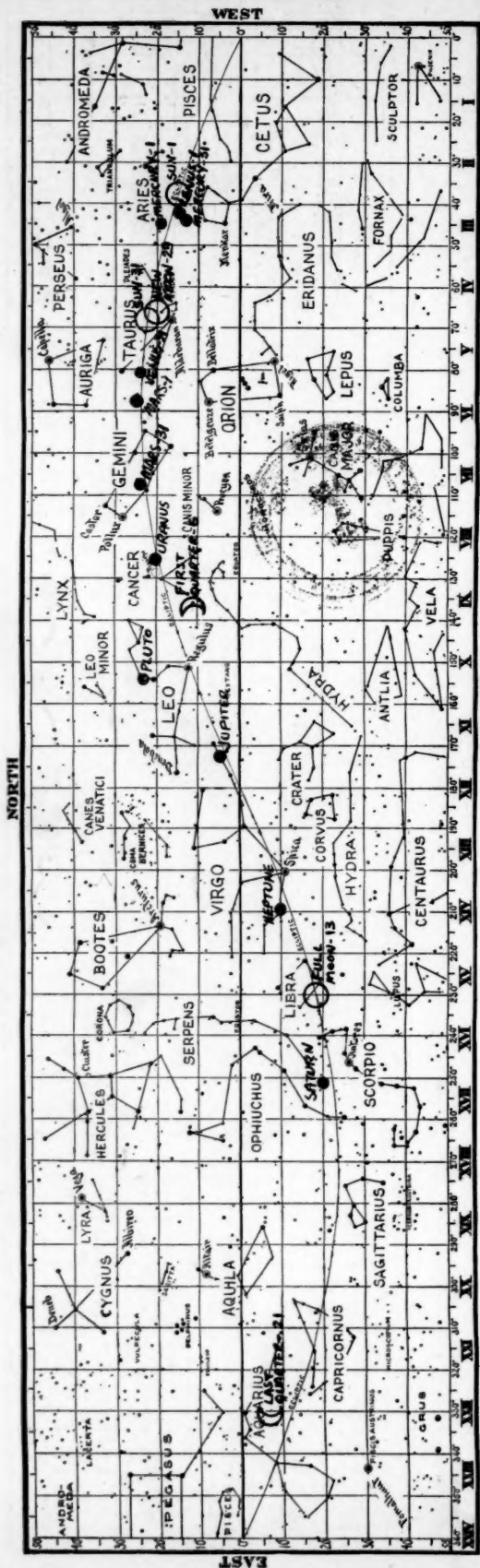
Showing also the position of the Sun at the beginning and ending of the month and the position of the Moon at its several phases.



# A MERCATOR PROJECTION OF THE STAR FIELD FOR 50° NORTH AND 50° SOUTH OF THE EQUATOR

The Star Field makes an apparent complete revolution westward every 24 hours, hence the hourly division from I to XXIV, but this has no relation to the time that any portion of the map is in view. Practical as a Star, Constellation and Planet Finder for the current months—May-June, 1957—Anywhere in the world.

Showing also the position of the Sun at the beginning and ending of the month and the position of the Moon at its several phases.



Nov. 5 Oct. 22 Oct. 5 Sept. 20 Sept. 5 Aug. 20 Aug. 5 July 20 July 5 June 20 June 5 May 20 May 5 Apr. 20 Apr. 5 Mar. 20 Mar. 5 Feb. 18 Feb. 2 Jan. 20 Jan. 5 Dec. 20 Dec. 5 Nov. 20  
THE DATE BELOW EACH NUMERAL WILL SHOW WHEN THAT SECTION OF THE MAP WILL BE ON THE MERIDIAN—DUE SOUTH—AT 9 P.M. OR AN HOUR EARLIER  
FOR EACH NUMERAL WEST OF THIS DATE AND AN HOUR LATER FOR EACH NUMERAL EAST.